

ART. XX.—*The New Chain Test Range at the Melbourne Observatory.*

By R. L. J. ELLERY, C.M.G., F.R.S., F.R.A.S.

[Read 14th December, 1893.]

The old chain test range laid down in the Observatory grounds in March, 1871, was found in January, 1892, to have a small increasing error, and being only six inches above the ground surface, was found inconvenient to use. It was formed by five cubical blocks of sandstone, set on brick and cement foundations, one at either end of the 100 feet range, others at 50 feet, 33 feet, and 66 feet. Gun-metal plates fixed to the stones carried the fiducial marks. In March, 1893, a new range was erected, consisting of four heavy brick and cement piers, 2ft. 5in. high, 2ft. long, by 18in. wide, capped with blocks of rubbed "blue-stone." A platform from pier to pier was built of stout deal planks, T-shaped, supported on 6in. by 6in. red-gum posts firmly fixed in the ground. The height of this platform and surface of cap-stones is about 2ft. 5in., and very convenient for measuring and comparing. The fiducial marks are on gun-metal blocks, fastened to the stone caps at 0ft., 50ft., 66ft., and 100ft. On the 66ft. pier are two marks 12in. apart; one is 16ft. from the 50ft., and the second 33ft. from the 100ft., so as to obtain a standard foot and a half-chain measure. At the terminal piers wooden pillars are fixed to hold the adjusting screws and tension springs for stretching chains and tapes, and the fiducial marks are arranged to measure from end handles ("bût a bût") or marks ("traits"). Tension can be given to any chain, tape, or other measure at any intermediate point by means of a shifting toggle, to which the tension screws can be attached. The measures of this range were made with the 10ft. steel bars used for the Victorian base line, the measurement being made in the same manner—that is, bars placed end to end, but about one-fourth of an inch apart, aligned and levelled, the space being measured

by a graduated wedge of bell-metal. The lengths are found to be as follows (reduced to a temperature of 62° Fahr): 0 to 100 = 1199.9749 inches, 0 to 50 = 599.9647, 50 to 100 = 600.0103.

The old range measured at 66 and 100, when first put up, 792.18 inches and 1200.20 inches; but just before removal the measure was 792.22 and 1200.32.

The stability of such ranges is found to be extremely good, but not absolutely perfect, for a secular change in the old range of 0.12 inches took place. This, however, is of no moment, as no standard measures are absolutely correct or perfectly permanent; the only point necessary is that the value of the standard should be obtained from time to time, and persons using the test should always obtain the value from the latest measures.

For very accurate comparisons and for determining expansions in high temperatures, a heavy iron block, with reading microscope, has been made, by which variations of $\frac{1}{1000}$ are easily measured.